

Community Development Department

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CITY of NAPA

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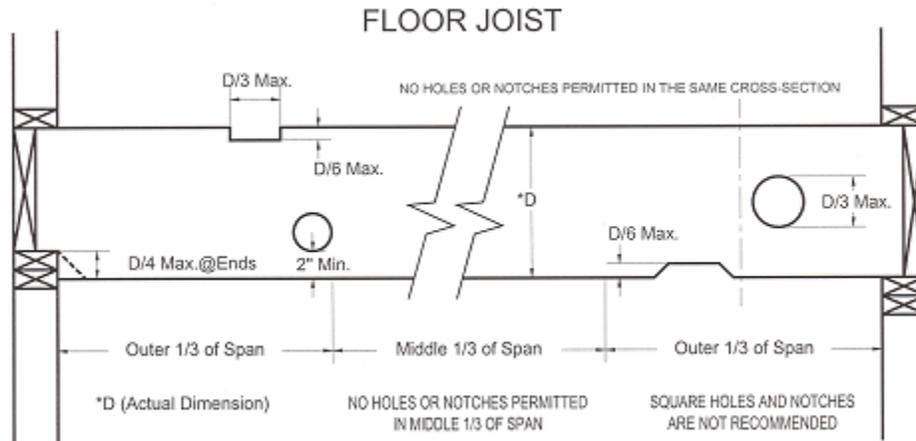
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Napa Fire Department
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NOTCHING AND BORING FLOOR JOIST AND WALL STUDS



NO HOLES OR NOTCHES PERMITTED IN MIDDLE 1/3 OF SPAN

SQUARE HOLES AND NOTCHES ARE NOT RECOMMENDED

Joist Size	Max. Hole	Max. Notch Depth	Max. End Notch
2x4	NONE	NONE	NONE
2X6	1-1/2"	7/8"	1-3/8"
2X8	2-3/8"	1-1/4"	1-7/8"
2X10	3"	1-1/2"	2-3/8"
2X12	3-3/4"	1-7/8"	2-7/8"

See Section 2320.8.3 '97 CBC for Floor Joists

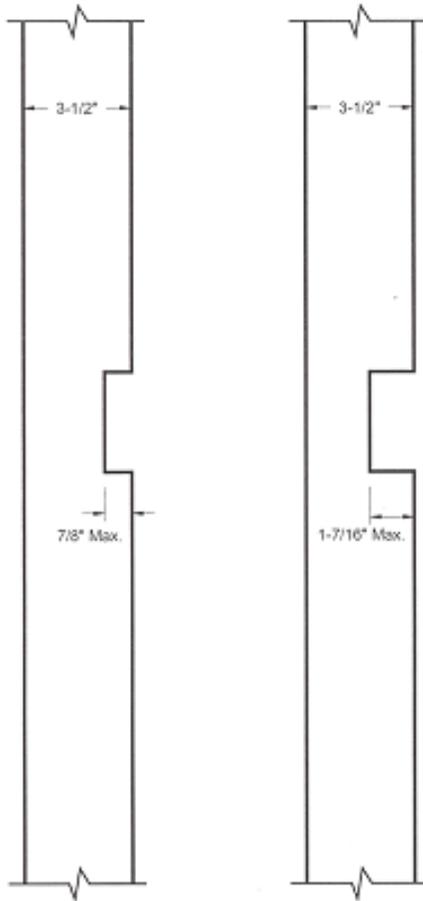
Notches on the ends of joists shall not exceed one fourth the joist depth. Holes bored in joists shall not be within 2 inches of the top or bottom of the joist, and the diameter of any such hole shall not exceed one third the depth of the joist. Notches in the top or bottom of joists shall not exceed one sixth the depth and shall not be located in the middle third of the span..

See Section 2320.12.4 '97 CBC for Roof Rafters and Ceiling Joists

Notching at the ends of rafters or ceiling joists shall not exceed one fourth the depth. Notches in the top or bottom of the rafter or ceiling joist shall not exceed one sixth the depth and shall not be located within the middle one third of the span, except that a notch not exceeding one third of the depth is permitted in the top of the rafter or ceiling joist not further from the face of the support than the depth of the member.

All forms and handouts are available on www.cityofnapa.org

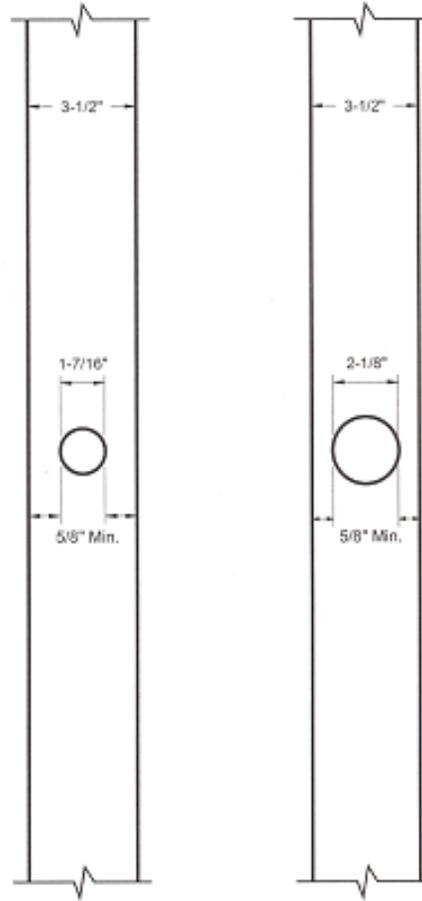
NOTCHING AND CUTTING



25% Allowed
in exterior and
bearing walls

40 % Allowed
in any
nonbearing wall

BORED HOLES



40 % Allowed
in any wall

60 % Allowed
in any
nonbearing wall

See Sections 2320.11.9 & 10 '97 CBC for Studs

Bored holes not greater than 60% of the width of the stud are permitted in non-bearing partitions or in any wall where each bored stud is doubled, provided not more than two such successive doubled studs are so bored. In no case shall edges of bored hole be nearer than 5/8 inch to the edge of the stud. Bored holes shall not be located at the same section of stud as a cut or notch.

Guidelines

Intended for use by residential builders, this WWPA TIP Sheet serves as a guide to code-allowed size and placement of cuts (notching and boring) in floor-joist and stud-wall framing members.

A number of problems can occur if cuts are made through framing members to make room for plumbing or electrical runs, ductwork, or other mechanical elements such as sound or security systems. Whenever a hole or notch is cut into a member, the structural capacity of the piece is weakened and a portion of the load supported by the cut member must be transferred properly to other joists. It is best to design and frame a project to accommodate mechanical systems from the outset, as notching and boring should be avoided whenever possible; however, unforeseen circumstances sometimes arise during construction. If it is necessary to cut into a framing member, the following diagrams provide a guide for doing so in the least destructive manner. Diagrams comply with the requirements of the three major model building codes: Uniform (UBC), Standard (SBC), and National (BOCA), and the CABO One- & Two-Family Dwelling Code.

FLOOR JOISTS

The following references are to actual, not nominal dimensions. (*Placement of Cuts in Floor Joists* and Table 1: *Maximum Sizes for Cuts in Floor Joists*.)

Holes: Do not bore holes closer than 2" from joist edges, nor make them larger than 1/3 the depth of the joist.

Notches: Do not make notches in the middle third of the span where the bending forces are greatest. Notches should be no deeper than 1/6 the depth of the joist. Notches at the end of the joist should be no deeper than 1/4 the depth. Limit the length of notches to 1/3 of the joist's depth.

When a Notch Becomes a Rip

Codes do not address the maximum allowable length of a notch; however, the 1991 *National Design Specification (NDS)* does limit the maximum length of a notch to 1/3 the depth of a member.

It is important to recognize the point at which a notch becomes a rip, such as when floor joists at the entry of a home are ripped down to allow underlayment for a tile floor. Ripping wide dimension lumber lowers the grade of the material, and is unacceptable under all building codes. When a sloped surface is necessary, a non-structural member can be ripped to the desired slope and fastened to the structural member in a position above the top edge. Do not rip the structural member.

STUD WALLS

When structural wood members are used vertically to carry loads in compression, the same engineering procedure is used for both studs and columns. However, differences between studs and columns are recognized in the model building codes for conventional light-frame residential construction. The term "column" describes an individual major structural member subjected to axial compression loads, such as columns in timber-frame or post-and-beam structures. The term "stud" describes one of the members in a wall assembly or wall system carrying axial compression loads, such as 2x4 studs in stud wall that includes sheathing or wall board. The difference between columns and studs can be further described in terms of the potential consequences of failure. Columns function as individual major structural members; consequently failure of a column is likely to result in partial collapse of a structure (or complete collapse in extreme cases due to the domino effect). However, studs function as members in a system. Due to the system effects (load sharing, partial composite action, redundancy, load distribution, etc.), studs are much less likely to fail and result in a total collapse than are columns. Notching or boring into columns is not recommended and rarely acceptable; however, model codes establish guidelines for allowable notching and boring into studs used in a stud-wall system. Figures 2 and 3 illustrate the maximum allowable notching and boring of 2x4 studs under all model codes except BOCA. BOCA allows a hole one third the width of the stud in all cases. Bored holes shall not be located in the same cross section of a stud as a cut or notch.

For additional information on framing (and common framing errors), contact WWPA for reprints of the following articles written by Association field staff.

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